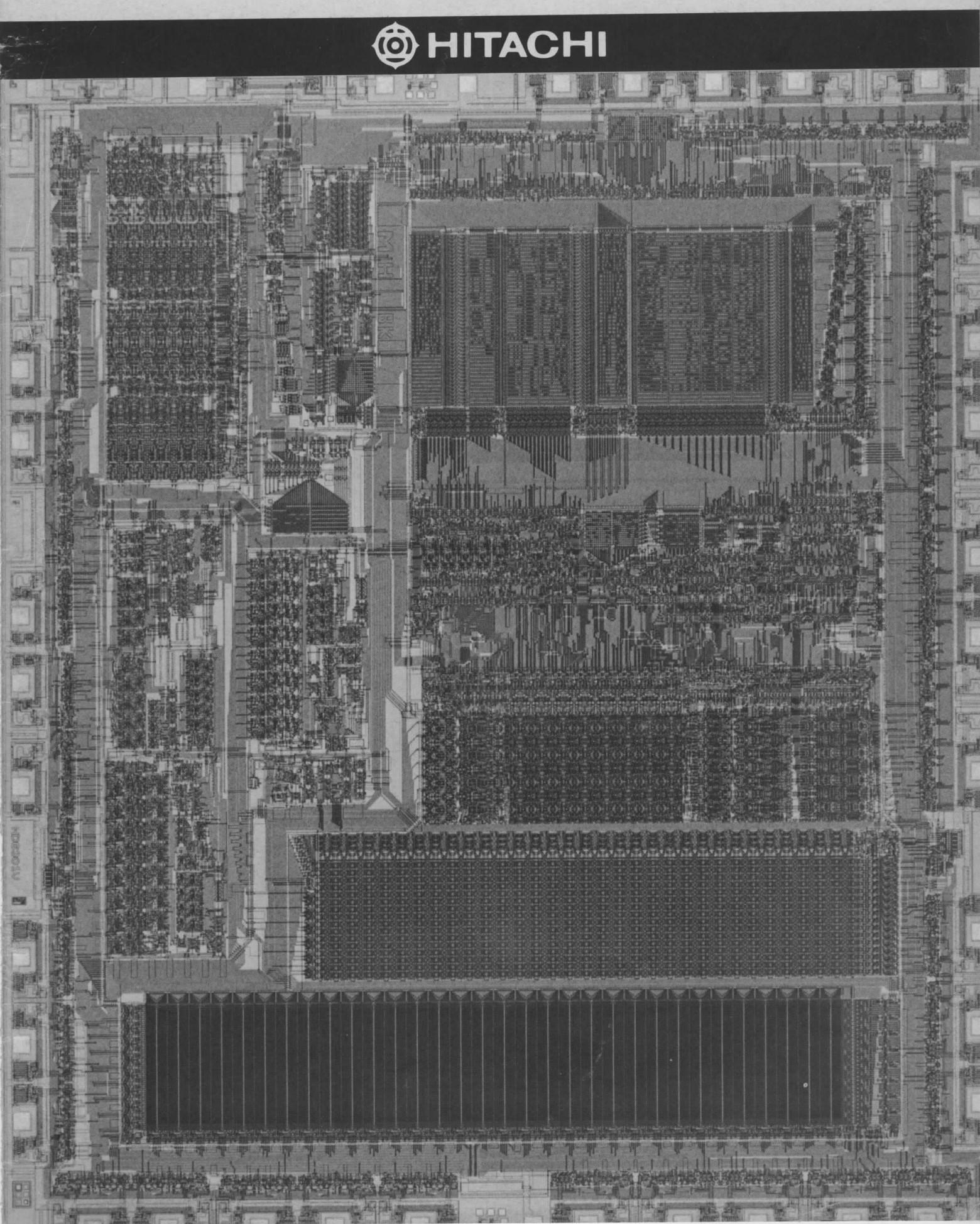


HITACHI MICROCOMPUTER SYSTEM

4BIT • 8BIT • 16BIT





FULL LINE UP OF 4-BIT, 8-BIT, 16-BIT MICROCOMPUTER SYSTEMS. COMPLETE, EFFECTIVE HARDWARE & SOFTWARE. THE FINEST MICROCOMPUTER SYSTEM CAN BE DEVELOPED FROM HITACHI LINE-UP & WITH HITACHI SUPPORT SYSTEMS.

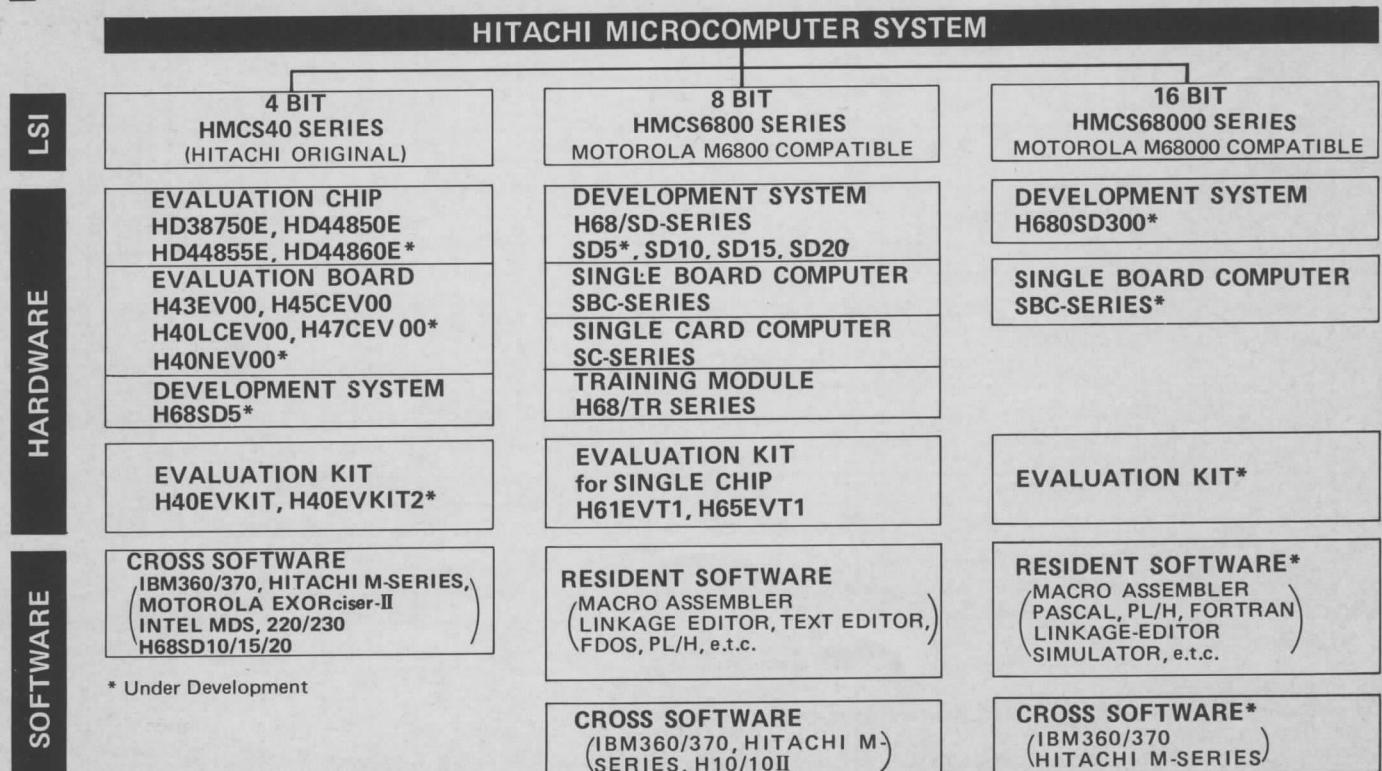


MUSASHI WORKS

HITACHI MOS MICROCOMPUTER SYSTEMS range from the 4-Bit Single-Chip Micro Computer for small systems to the high-performance 16-Bit for large systems. The 4-Bit HMCS40 Series are Hitachi Original High Cost-Performance 4-Bit Microcomputers. PMOS, CMOS and NMOS can be selected according to the users applications. The 8-Bit HMCS6800 Series have been developed in cooperation with Motorola, U.S.A. And Hitachi Original Powerful Devices are incorporated in the 8-Bit Series. For the 16-Bit HMCS68000 Series, Hitachi and Motorola established an even closer Technical Exchange Agreement in the case of the 8-Bit 6800 Series. Hitachi is aiming at the speedy development of the HMCS68000 Series. Support Systems for developing each family are also available and the Standard Board for building the system into the equipment are available, too.



■ THE OUTLINE OF HITACHI MICROCOMPUTER SYSTEM



A wide variety of kinds for easy selection of optimum chip.

4-BIT SINGLE-CHIP MICROCOMPUTER HMCS40 SERIES

The HMCS40 Series are High Cost-Performance 4-Bit Single-Chip Microcomputers designed for dedicated applications and composed of PMOS, CMOS and NMOS LSIs.

The Instruction Set of HMCS40 Series is exactly the same, except for the HMCS42/42C whose Instruction Set comprises a subset of full Instructions.

This Feature is convenient for users for chip selection and system expansion.

■ FEATURES

★ Full Line-up: PMOS/CMOS/NMOS

0.5~4 k Words ROM

32~256 Words RAM

22~46 I/O Lines

★ All Instructions except one Instruction are Single-Cycle

★ Pattern Generation Instruction
(Table Reference Capability)

★ Powerful Interrupt Function (except HMCS42/42C)

★ 3 Interrupt Source
└ 2 External Interrupt Lines
 1 Timer/Event Counter

★ High Voltage Output (50V): PMOS

★ Low Power Dissipation (2mw): CMOS

★ High Speed (Cycle Timer 2 μ s): NMOS

★ Built-in Clock Pulse Generator
(Resister or Ceramic Filter)

★ Built-in Power-on Reset Circuitry

★ Battery-Back-up: PMOS, CMOS (except HMCS42)

★ I/O Options (User Selectable at Each Pin)

★ PMOS: Pull up Resister/Open Drain

★ CMOS: Pull up Resister/Open Drain/CMOS Output.
NMOS: Pull up Register

■ HMCS40 SERIES PRODUCT CHARACTERISTICS

Family Name		HMCS42	HMCS42C	HMCS43	HMCS43C	HMCS44A	HMCS44C	
LSI Characteristics	Process	PMOS	CMOS	PMOS	CMOS	PMOS	CMOS	
	Supply Voltage (V)	-10	5	-10	5	-10	5	
	Power Dissipation (mW)	100	1.5	100	2	150	2	
	Max. I/O Terminal Voltage (V)	-50	10****	-50	10****	-50	10****	
	Output Characteristics	1.8V/10mA 1.8V/3mA	2.4V/-1mA 0.8V/1.6mA	1.8V/10mA 1.8V/3mA	2.4V/-1mA 0.8V/1.6mA	1.8V/10mA 1.8V/3mA	2.4V/-1mA 0.8V/1.6mA	
	Operating Temperature Range (°C)	-20~+75**	-20~+75**	-20~+75**	-20~+75**	-20~+75**	-20~+75**	
	Package	DP-28	DP-28	DP-42	DP-42	DP-42	DP-42	
Function	Memory	ROM (bits) 32x10***	512x10 32x10***	1,024x10 64x10***	1,024x10 64x10***	2,048x10 128x10***	2,048x10 128x10***	
	RAM (bits)	32x4	32x4	80x4	80x4	160x4	160x4	
	Registers	4	4	6	6	8	8	
	Stack Registers	2	2	3	3	4	4	
I/O Ports	Data Input		4x1		4x1		—	
	Discrete Input		—		—		—	
	Data Output		4x2		4x2		—	
	Discrete Output		1x6		1x12		32	
	Data Input/Output		—		4x1		4x4	
	Discrete Input/Output		1x4		1x4		1x16	
Interrupts	External	—	—	2	2	2	2	
	Timer	—	—	Yes	Yes	Yes	Yes	
	Event Counter	—	—	Yes	Yes	Yes	Yes	
Instructions	Number of Instructions	51	51	71	71	71	71	
	Cycle Time (μ s)	10	10	10	10	10	10	
Clock Pulse Generator								
Power on Reset								
Battery Back-up								
Evaluation Chip		HD38750E HD44850E	HD44850E	HD38750E HD44850E	HD44850E	HD44850E	HD44850E	

* Under Development.

** -40~+85°C (Special Request) Please contact Hitachi Agents.

*** Pattern Memory.

**** Applied to NMOS open drain outputs. Supply Voltage +0.3 (V) is applied to other pins.

A chip designed specially for LCD is now available.

LCD-SERIES LCD-II & LCD-III (UNDER DEVELOPMENT)

The LCD-Series is designed for dedicated applications which in particular use on LCD as Display Devices.

The LCD-Series is best suited for battery back-up or battery powered application because of the low power consumptive CMOS process together with the LCD's low power dissipation.

LCD-II is a Dot Matrix type LCD-Driver controlled by another Microcomputer.

LCD-III is designed for a Segment type LCD, which includes the processor based on HMCS40 series architecture.

■ FEATURES

LCD-II

- ★ Alphanumeric 5 x 7 or 5 x 10 Dot Matrix LCD-Controller and Driver.
- ★ Easy to Interface with 4-Bit and 8-Bit Microcomputer.
- ★ Display Data RAM 80 x 8 Bits (8 Bits/Digit: Max 80 Digits)
- ★ Easily Expandable LCD Drivers (HD44100)
- ★ On-Chip LCD Drivers 16 Common Drivers and 40 Segment Drivers.

LCD-III

- ★ 4-Bit HMCS40 Architecture
Instruction are fully compatible with HMCS40 Series.
- ★ Powerful Interrupt Function
3 Interrupt └─ 2 External Interrupt
 └─ 1 Timer/Event Counter
- ★ Automatic display Operation.
- ★ Easily Expandable LCD Drivers (HD44100)
On-Chip LCD Direct Drive
- ★ Standby Mode

■ LCD II/III CHARACTERISTICS

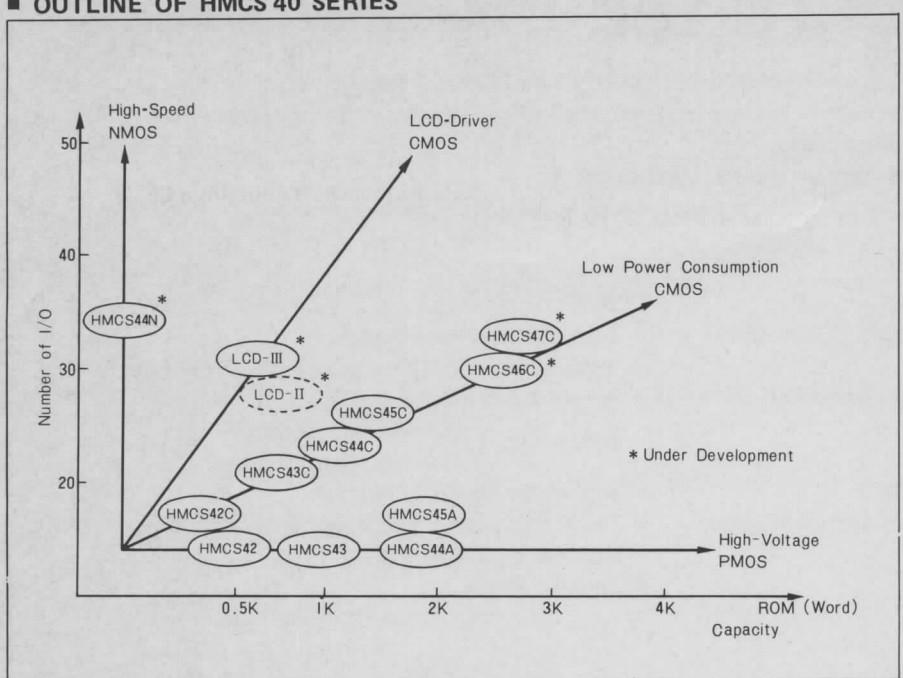
	*HMCS44N	HMCS45A	HMCS45C	* HMCS46C	* HMCS47C
NMOS	PMOS	CMOS	CMOS	CMOS	CMOS
5	-10	5	5	5	5
450	150	2	4	4	4
5	-50	10****	5	5	5
1.6mA/0.4V	1.8V/10mA 1.8V/3mA	2.4V/-1mA 0.8V/1.6mA	2.4V/-1mA 0.8V/1.6mA	2.4V/-1mA 0.8V/1.6mA	2.4V/-1mA 0.8V/1.6mA
-20~+75**	-20~+75**	-20~+75**	-20~+75**	-20~+75**	-20~+75**
DP-42	FP-54	FP-54	DP-42	FP-54	FP-54
2,048x10 128x10***	2,048x10 128x10***	1,048x10 128x10***	4,096x10	4,096x10	4,096x10
160x4	160x4	160x4	256x4	256x4	256x4
6	6	6	6	6	6
4	4	4	4	4	4
32	— — — — 4x4 1x16	— — — 4x1 — 4x6 1x16	— — — 4x1 — 4x6 1x16	— — — 4x1 — 4x6 1x16	— — — 4x1 — 4x6 1x16
2	2	2	2	2	2
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
71	71	71	71	71	71
2	10	10	5	5	5
Yes (External)					
—	RAM Hold	Halt	Halt	Halt	Halt
*HD44860E	HD44850E		HD44855E		

	Type Number	LCD-II	LCD-III
LSI Characteristics	Type Number	HD44780	HD44790
	Process	CMOS	CMOS
	Supply Voltage (V)	5V*	3/5V*
	Operating Temperature	-20~+75°C**	-20~+75°C**
	Package	FP-80	FP-80
	Power Dissipation	5	1/2
Memory	ROM bits	—	2,048x10 bit
	pattern ROM	—	128x10 bit
	RAM	80x8	160x4
Stack Register		—	4
I/O	Universal	—	32
	Interface with CPU	11	—
	Interface with Driver IC	4	(4)
Interrupt	External	—	2
	Timer/Counter	—	Yes
Instructions	Number of Inst.	(—)	(71)
	Cycle Time	—	20/10 µs
	Common	16	4
LCD Drive	Segment	40	32
	Duty	1/8,1/11,1/16	static,1/2,1/3,1/4
	Bias	1/4, 1/5	static,1/2,1/3
Display Capability		16 Digits (5x7 Dot Matrix 1/16 Duty)	4x32 Matrix (1/4 Duty)
Comment		Expandable to 80 Digits using external driver HD44100	Expandable to 4x128 Matrix using external driver HD44100

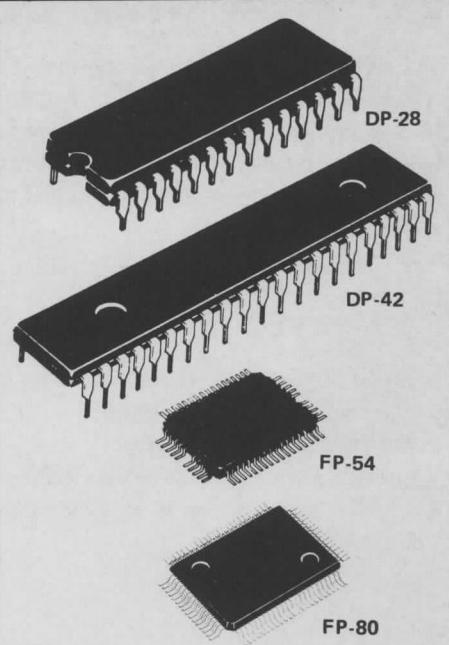
* except for Power Supply for LCD.

** -40~+85°C (Special Request), Please contact Hitachi Agents.

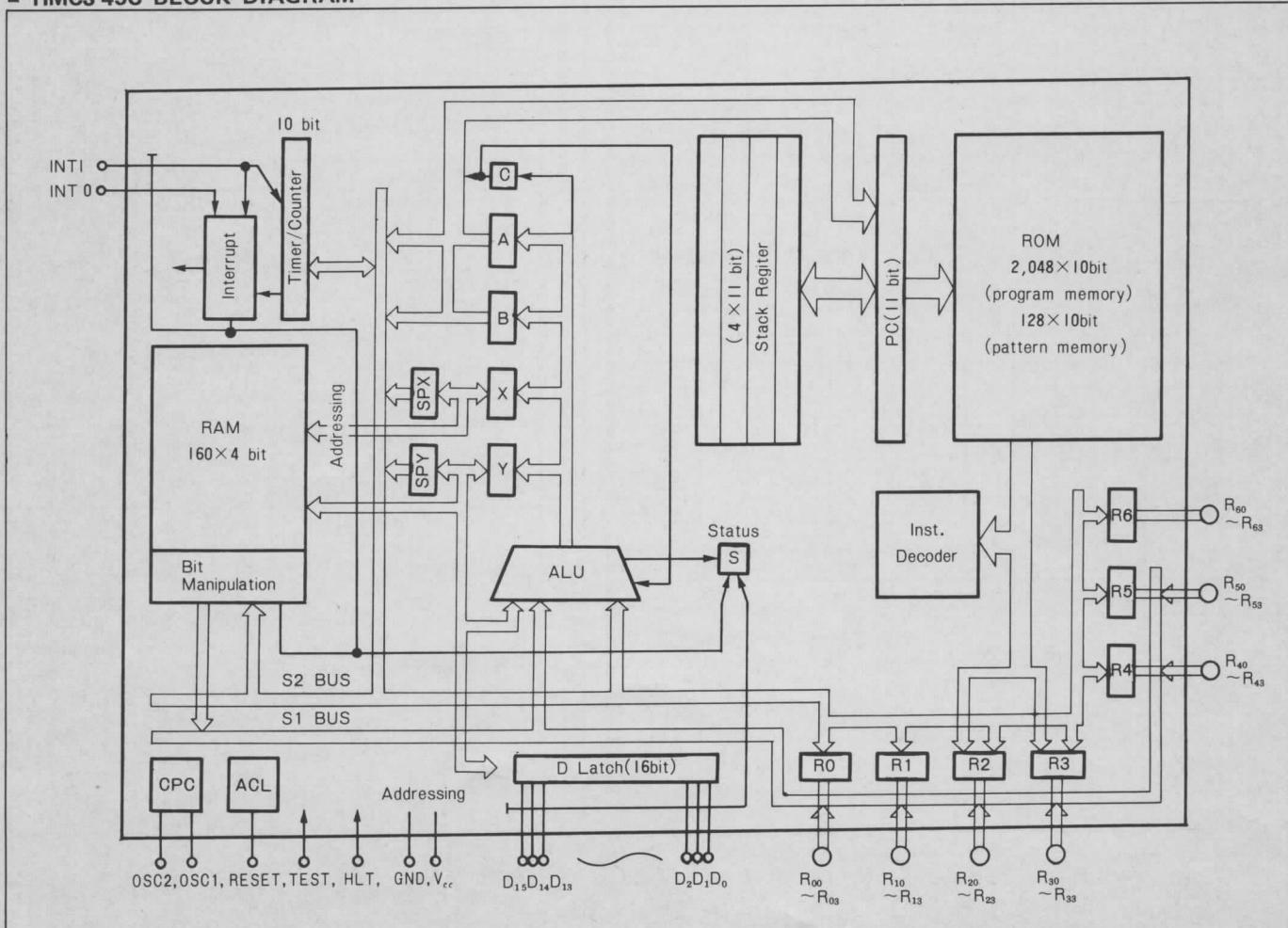
■ OUTLINE OF HMCS 40 SERIES



■ HMCS40 SERIES PACKAGE



■ HMCS 45C BLOCK DIAGRAM



The line-up will be expanded for a wider range of applications.

8-BIT MICROCOMPUTER HMCS6800 SERIES 8-BIT SINGLE-CHIP MICROCOMPUTER

HMCS 6800 Series 8-Bit Single-Chip Microcomputers comprise the HD6801 Family and HD6805 Family.

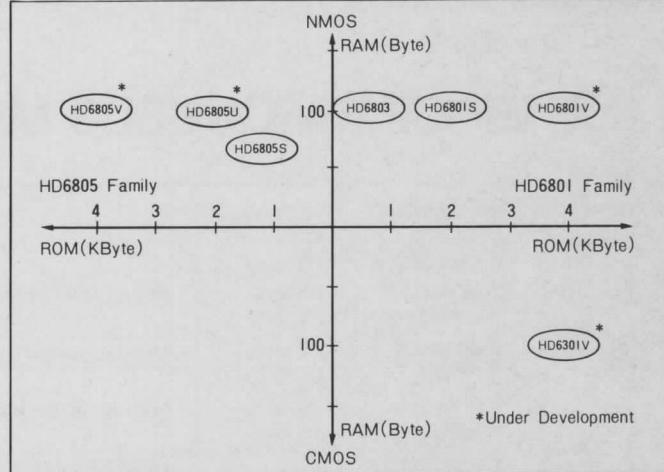
The HD6801 Family are designed for 8-Bit Microcomputer Unit (MCU) aiming at High-Performance. It contains a CPU, Oscillator, ROM, RAM, TIMER and I/O Port. In particular the HD6301V is a CMOS type, upward compatible with HD6801 architecture.

The HD6805 Family are designed for 8-Bit Microcomputer Unit, for machinery controll. It contains, a CPU, Oscillator, ROM, RAM and I/O Port.

■ FEATURES

- ★ Versatile Interrupt Handling.
- ★ Powerful Indexed Addressing.
- ★ Full set of Conditional Branches.
- ★ Memory Mapped I/O.
- ★ 16-Bit Timer (6801/6301)
- ★ 8-Bit Programmable Timer with 7-Bit Programmable Pre-scaler (6805)
- ★ 8 x 8 Multiply. (6801/6301)
- ★ Sleep Operation for Power Saving. (6301)
- ★ True Bit Manipulation. (6805)

■ OUTLINE OF 8-BIT SINGLE-CHIP MICROCOMPUTER



■ 8-BIT SINGLE-CHIP CHARACTERISTICS

Type Number		HD6801S	HD6801V*	HD6803	HD6301V*	HD6805S	HD6805U*	HD6805V*
LSI Characteristics	Process	NMOS	NMOS	NMOS	CMOS	NMOS	NMOS	NMOS
	Supply Voltage	5V	5V	5V	5V	5V	5V	5V
	Operation Temperature**	0~70°C	0~70°C	0~70°C	0~70°C	0~70°C	0~70°C	0~70°C
	Package	DP-40 DC-40	DP-40 DC-40	DP-40 DC-40	DP-40 DC-40	DP-28 DC-28	DP-40 DC-40	DP-40 DC-40
Function	Memory	ROM (k Byte)	2	4	—	4	1.1	2
		RAM (Byte)	128	128	128	128	64	96
	I/O		29	29	13	29	20	32
	Timer (bit)		16	16	16	16	8***	8***
SCI		Yes	Yes	Yes	Yes	No	No	No
Other Features		• Data Retention Capability	• Data Retention Capability	• Multiplexed Address and Data.	• Sleep Operation • Low power Consumption • Internal clock Divided by Four.	• Vectored Interrupts • Self-check Mode • Master Reset	• Voltage Comparator	• Voltage Comparator
Compatibility		MC6801	—	MC6803	—	MC6805P2	—	—

* Under Development.

** Wide Temperature Range (-40~+85°C). Please contact Hitachi Agents.

*** Timer: 8-Bit programmable Timer with 7-Bit programmable pre-scaler.

High-performance, multiple-function LSIs have been added to the family.

8-BIT MULTI-CHIP LSI

The HMCS 6800 Multi Chip Family is a systematic family which realizes a simple Computer System and also system expansion by using convenient MPUs and peripheral LSIs from the full line-up.

Especially, Hitachi HD465xx Type is a dedicated controller which can also simply interface with another architecture-type processor, except DMAC HD46504.

LINE-UP OF HMCS6800 MULTI-CHIP LSIS

Division	Type No.	Clock	Function	Compatibility	Package
MPU	HD46800D	1.0 MHz	8-Bit Micro Processor	MC6800 MC68A00 MC68B00	DP-40/DC-40
	HD468A00	1.5 MHz			
	HD468B00	2.0 MHz			
	HD46802	1.0 MHz	Micro Processor + Clock + RAM	MC6802	DP-40/DC-40
	HD6809	1.0 MHz	High-End 8-Bit Micro Processor	MC6809 MC68A09 MC68B09	DP-40/DC-40
	HD68A09	1.5 MHz			
	HD68B09	2.0 MHz			
CPG	HD6809E*	—	HD6809 External-clock Version	MC6809E	DP-40/DC-40
	HD26501	—	Clock Pulse Generator	Original	DG-16A
Peripheral LSI	HD268T26	—	BUS Driver/Receiver	S 8T26	DP-16/DG-16
	PIA	1.0 MHz	Peripheral Interface Adapter	MC6821 MC68A21 MC68B21	DP-40/DC-40
		1.5 MHz			
		2.0 MHz			
	ACIA	1.0 MHz	Asynchronous Communication Interface Adapter	MC6850 MC68A50	DP-24/DC-24
		1.5 MHz			
	SSDA	1.0 MHz	Synchronous Serial Data Adapter	MC6852 MC68A52	DP-24/DC-24
		1.5 MHz			
	COMBO	1.0 MHz	Combination ROM I/O Timer	MC6846	DP-40/DC-40
	PTM	1.0 MHz	Programmable Timer Module	MC6840	DP-28
	CMTC	1.0 MHz	Digital Cassette MT Controller	Original	DC-40
	FDC	1.0 MHz	Floppy Disk Controller	MC6843	DP-40/DC-40
		1.5 MHz			
	DMAC	1.0 MHz	Direct Memory Access Controller	MC6844	DP-40/DC-40
		1.5 MHz			
		2.0 MHz			
	CRTC	1.0 MHz	CRT Display Controller	MC6845	DP-40/DC-40
		1.5 MHz			
		2.0 MHz			
	ADU	1.0 MHz	CRT Display Controller	MC6845S	DP-40/DC-40
		1.5 MHz			
		2.0 MHz			
Memory	HD46508	1.0 MHz	Analog Data Acquisition Unit	Original	DP-40
	HD46508-1	1.5 MHz			
	HD46508A	1.0 MHz	Analog Data Acquisition Unit	Original	DP-40
	HD46508A-1	1.5 MHz			
Memory	HM46810	1.0 MHz	128 x 8 Bit Static RAM	MCM6810	DP-24/DC-24
	HM468A10	1.5 MHz		MCM68A10	
	HN46830	2.0 MHz	1,024 x 8 Bit ROM	MCM6830	DC-24/DP-24

* Under Development.

NOTE: Operating Temperature Range. (-20~+75°C).

The first VLSI of the third generation.

16-BIT MICROCOMPUTER HMCS68000 SERIES

Advances in Semiconductor Technology have made it possible to place on a single chip microprocessor of an order of magnitude higher in performance and circuit complexity than that previously available.

The HD68000 is one such VLSI microprocessor. It combines state-of-the-art technology and advanced circuit design techniques with computer technology to achieve an architecturally advanced 16-Bit microprocessor.

The HD68000 is available for use with High Level Language like Pascal Compila (Fortran Compila) and Super PL/H Compila for programming.

Development of peripheral LSIs is progressing on schedule. On the other hand, it is possible to use HMCS 6800's peripheral LSIs.

16-BIT MICROCOMPUTER HMCS68000 LINE-UP

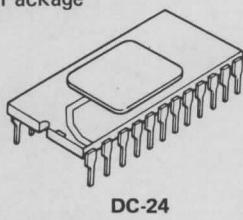
Division	Type No.	Function	Compatibility	Package
MPU	HD68000	16-Bit Micro Processor	MC68000	DC-64
Peripheral LSIs	DMAC	Direct Memory Access Controller	MC68450	DC-64
	MMU	Memory Management Unit	MC68451	DC-64
	IPC	8-Bit Intelligent Peripheral Controller	MC68120	DC-48
	PIT	Parallel Interface Timer	MC68230	DC-48
	MPCC	Multi-Protocol Communication Controller	MC68561	DC-48

* Under Development.

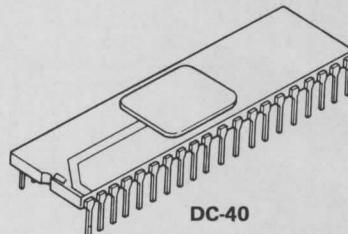
NOTE: Operating Temperature Range: (0 ~ 70°C)

■ HMCS6800 Series PACKAGE

Dual in Line Ceramic Package

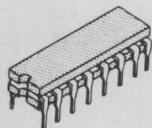


DC-24

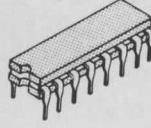


DC-40

Dual in Line Ceramic Package (Glass Sealed)

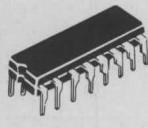


DG-16

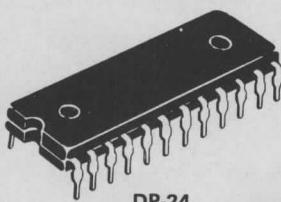


DG-16A

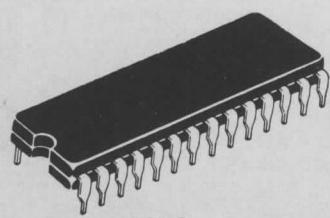
Dual in Line Plastic Package



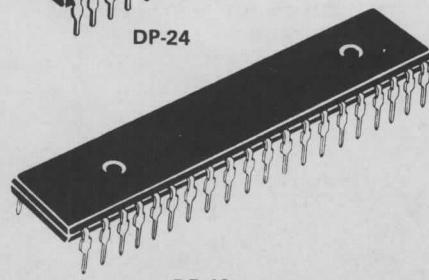
DP-16



DP-24

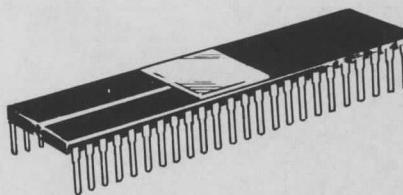


DP-28

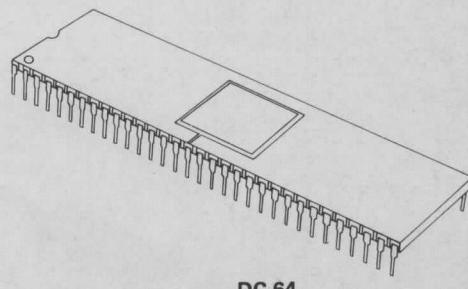


DP-40

■ HMCS68000 Series PACKAGE Dual in Line Ceramic Package



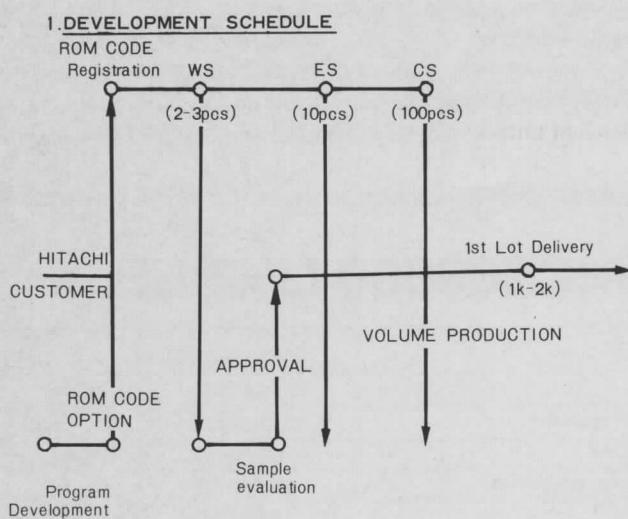
DC-48



DC-64

HITACHI 4-BIT/8-BIT SINGLE CHIP MICROCOMPUTER DEVELOPMENT SCHEDULE

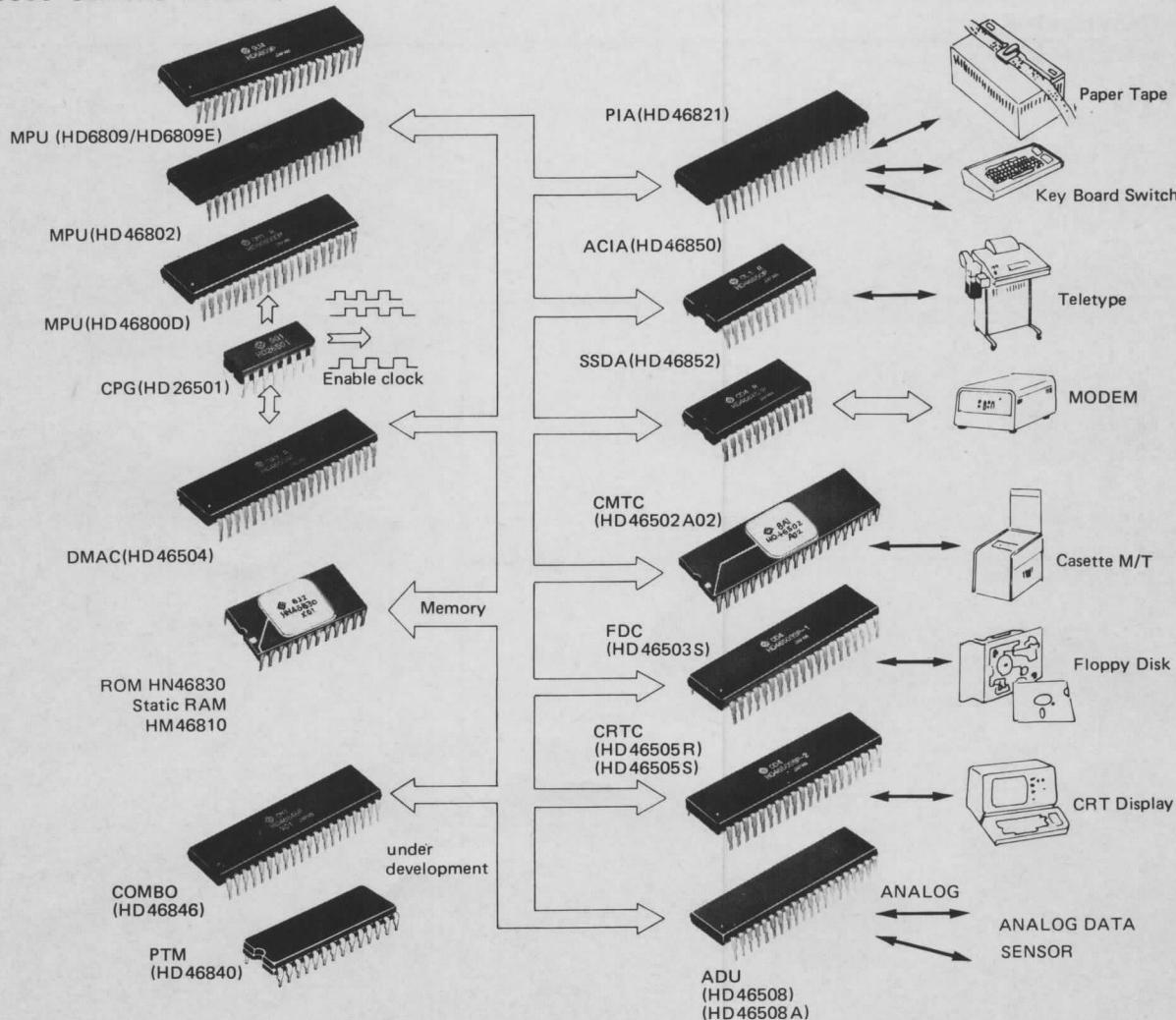
1. DEVELOPMENT SCHEDULE



2. Remarks

- # Hitachi starts the development after receiving ROM CODE & OPTION from customers with the above schedule.
- # Customers program media (ROM CODE): Paper Tape or EP-ROM.
- # ES will be submitted after receiving approval of WS only.
- # Delivery Term of Volume Production depends on Customer's approval Term.
- # ROM CODE should be final one after completion of Customer's full Debugging & Simulation.
- # New Masking Charge is necessary whenever Customer effects Modification to the contents of ROM CODE prior to receiving Approval of WS.
- # WS: Working Samples. (only for checking the functions)
- ES: Engineering Samples. (for checking the Reliability & Quality)
- CS: Commercial Samples. (same Quality as Volume Production)
- # Detailed Schedule: Please contact Hitachi Agents.

HMCS6800 SERIES LINE-UP



A wide range of support tools are available.

DEVELOPMENT SYSTEMS

(SUMMARY)

Hitachi Development Systems enable the user to develop a complete integrated hardware, architecture and the most suitable software with great efficiency.

Development Systems are provided from the complete systems for each HMCS Series down to a low-cost evaluation kit and Cross Assemblers. The user can select the most suitable system from the Hitachi Line-up.

DEVELOPMENT SYSTEMS FOR HMCS 40 SERIES

■ Support Hardware

As the HMCS 40 Series support hard ware, the following are available. These tools enable debugging upto prototype from program development.

■ HMCS40 Series Support Software

As the HMCS40 series Support Software, the following Cross Assemblers are provided in order to develop systems of HMCS 40 Series easily and economically.

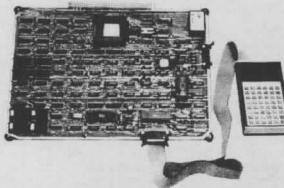
■ Cross Assembler

Type Number	Host Computer	Media	Source Program Format	Object Program Format
S40XAM1	32-Bit HITAC-M Series	MT Memory 100 k Byte	Card	Paper Tape
S40XAM1	32-Bit IBM 370	MT Memory 100 k Byte	Card	Paper Tape
S40XAS1	8-Bit H68SD10 6800 Base	Paper Tape Memory 16 k Byte	Paper Tape	Paper Tape
S40EXR1	8-Bit Motorola Exorciser II	Floppy Disk	Floppy Disk	EPROM
S40MDS1	8-Bit Intel MDS220/230	Floppy Disk	Floppy Disk	EPROM
S40XAE-1	8-Bit H40EVKIT 6800 Base	EP ROM Memory 4 k Byte	Paper Tape	Paper Tape
S40XAS2	H68SD15 H68SD20	Floppy Disk	Floppy Disk	EPROM

■ EVALUATION KIT H40EVKIT

H40EVKIT2 (under Development)

The Evaluation KIT is 1-Board Type development tool which provides "Debugger" "Assembler" and "Text Editor" functions when TTY or Typuter is connected, ability expands to all program development. (up to prototype hardware debugging.)



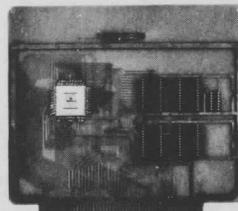
H40EVKIT
356 x 270mm, 100 pin

■ EVALUATION BOARD H43EV00 H45CEV00

H40LCEV00 H40NEV00 (Under Development)

H47CEV00 (Under Development)

The Evaluation Board consists of an Evaluation chip and EP ROM Sockets. The program evaluation and operating check of a prototype hardware are possible by connecting to prototype hardware.

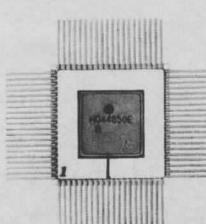


H45CEV00
230 x 200mm, 100 pin

■ EVALUATION CHIP HD38750E HD44850E HD44855E HD44860E

The Evaluation Chip is a ROM-less version of HMCS40. Program evaluation, operating-check of prototype hardware and/or single-step debugging by equipping it into a prototype hardware are possible.

Note: HD44855E is an Universal Chip. Additional external parts requested to realize the same character as each HMCS40 series.



HD44850E
HMCS45C/44C/43C/42C
45A/44A/43/42 use

Axial Quad Flat Package
80 pin.
CMOS Process

HMCS 40-SERIES SUPPORT SYSTEM LINE-UP

Tool	Type	P-MOS				C-MOS						N-MOS	
		42	43	44A	45A	42C	43C	44C	45C	46C	47C	LCD-III	44N
Evaluation KIT	H40EVKIT	•	•	•	•	•	•	•	•			•	
	H40EVKIT2*									•	•		•
Evaluation Board	H43EV00	•	•										
	H45CEV00	•	•	•	•	•	•	•	•				
	H47CEV00*									•	•		
	H40NEV00*												•
	H40LCEV00											•	
Evaluation CHIP	HD38750E	•	•										
	HD44850E	•	•	•	•	•	•	•	•				
	HD44855E									•	•	•	
	HD44860E												•

* Under Development.

HMCS 6800 SERIES SINGLE-CHIP DEVELOPMENT SYSTEM SUPPORT HARDWARE EVALUATION KIT H61EVT1 and H65EVT1

The H61EVT1 and H65EVT1 are the evaluation kits for HD6801 and HD6805 respectively.

The H61EVT1 and H65EVT1 provide effective tools for developing the Software and Hardware of a system using Micro Computer Units HD6801 and HD6805 and for training in implementing the HD6801/HD6805.

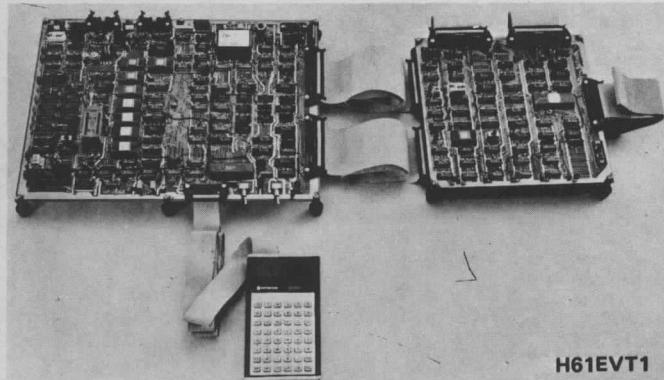
■ FEATURES

- ★ H61EVT1/H65EVT1 can be connected to a prototype system under development to assist in developing its hardware.
- ★ Assembler and Text Editor (EP ROM) can be used.
- ★ H61EVT1/H65EVT1 enable software to be developed on a floppy Disk base, when it is connected with H68/SD System.
- ★ EPROM Writer is provided for HN462716.

SUPPORT SOFTWARE CROSS SOFTWARE

Floppy Disk base development is, available by connecting H68/SD Series, Following cross software is provided, to realize Floppy Disk base development.

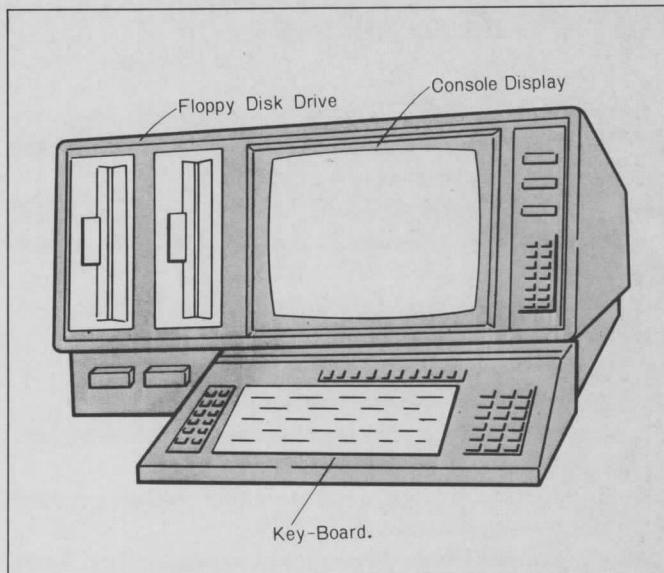
Type No.	H61XAS1-F	H65XAS1-F
CHIP No.	HD6801	HD6805
Host Machine	H68SD10/SD5 H68SD15/SD20	H68SD10/SD5 H68SD15/SD20
Media	Floppy Disk	Floppy Disk
Source Program	6801 Assembly Language	6805 Assembly Language
Object Program	Absolute or Relocatable Object Module	Object Program
Others	Macro Function	Output Assemble List.



A tool specially designed for use in developing Single-Chip HMCS40 and HMCS6800.

H68SD5 (Under Development) (for HMCS40 Series and HMCS6800 Single-Chip)

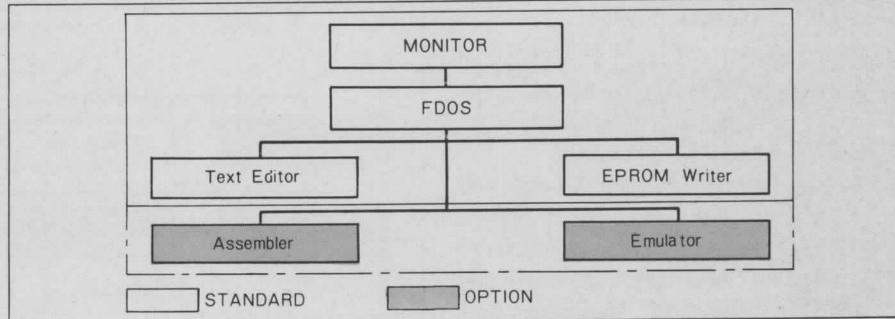
H68SD5 is a Floppy Disk Base General Purpose Development System. This system itself can perform system development for 8-Bit Single-Chip Microcomputers (HD6801 and HD6805) and various 4-Bit Single-Chip Microcomputers (HMCS40 Series).



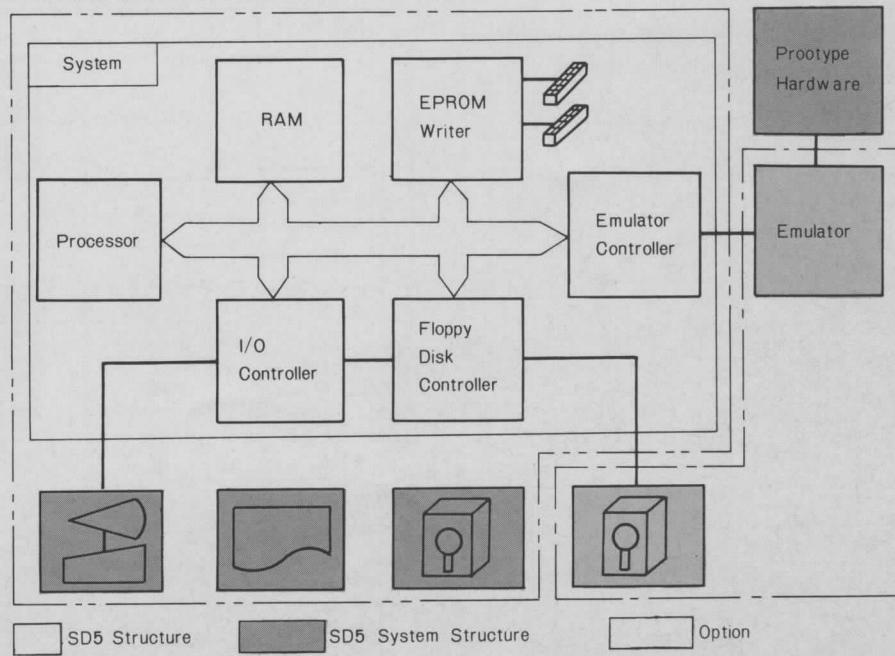
■ FEATURES

- ★ Supports Hitachi 8-Bit Single-chip and 4-Bit Single-chip microcomputers.
- ★ Total concept-to-production tool.
- ★ Low Cost
- ★ 56 k Byte R/W Memory.
- ★ 5 k Byte ROM (firm ware)
- ★ Disk based
- ★ RS-232C and Current loop peripheral interface.
- ★ Baud rate selection
- ★ Comprehensive in-circuit emulation with Single-step, break-point and trace.
- ★ ROM Pattern transmission by disk.

■ SOFTWARE STRUCTURE



■ HARDWARE STRUCTURE



I/O unit configurations most suitable to individual users can be designed.

H68SD10 (for HMCS6800)

H68SD10 is an effective system developing equipment for software development of HMCS6800 Microcomputer System or for a simple data processing equipment.

EMS (Executive Monitor System) function is incorporated as the debugging firm ware and it is very effective for system debugging.

The basic system consists of the following three Modules.

(1) MPU module (Control Block)

(2) DEBUG module (DEBUG Block)

(3) Dynamic Memory Module (Memory Block)

In addition maximum three extension modules can be added to the systems.

I/O interface for a teletype, a printer, a CRT display, a typewriter, PTR, etc. can be connected.

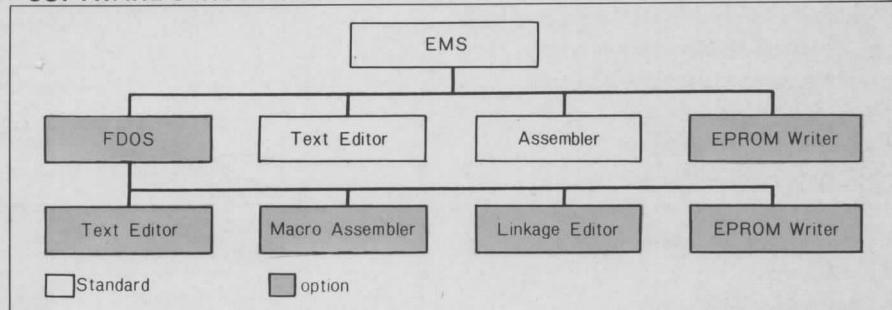
EMS (Executive Monitor System) and Assembler/Text Editor (in the form of paper tape) are prepared as system software and FDOS (Floppy Disk Operating System) can be added as extending software.

■ FEATURES

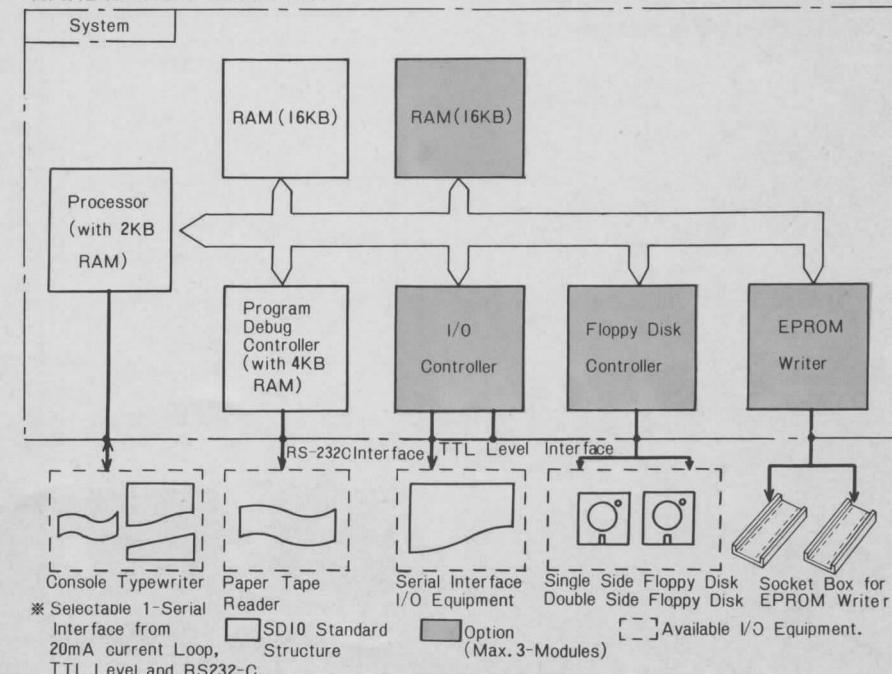
- ★ Conversational debugging of user's system is possible with Simple operation with the help of EMS function.
- ★ Simple connection with several I/O equipments is possible and it widens application area of the total system.
- ★ The system can be used not only as the software developing equipment but also as a simple data processing equipment.
- ★ System extension can be easily obtained by using Hitachi's SBC family.



■ SOFTWARE STRUCTURE



■ HARDWARE STRUCTURE

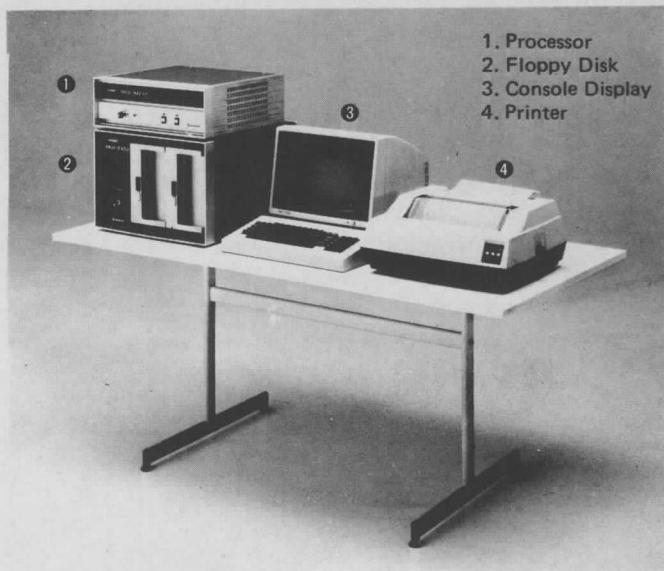


Useful for system designing and development.

H68SD15 (for HMCS6800)

H68SD15 is the Floppy Disk Base Development System developing equipment for software development of HMCS6800 Microcomputer System.

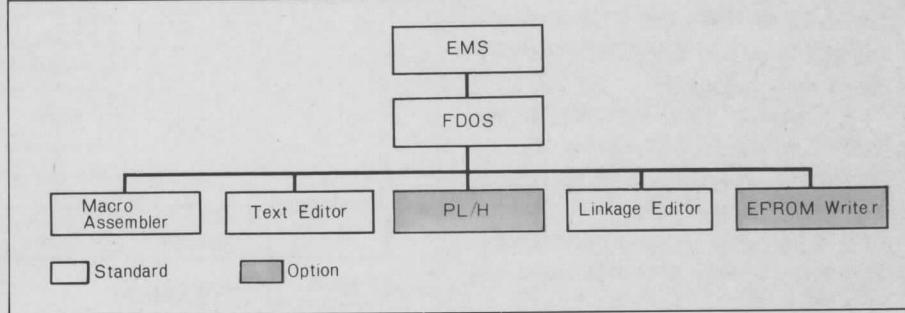
H68SD15 standard system is composed of the processor Console Display, Floppy Disk Drivers with sufficient printing Capacity of memory and can be used for High-Level Language PL/H to raise the Cost-Performance.



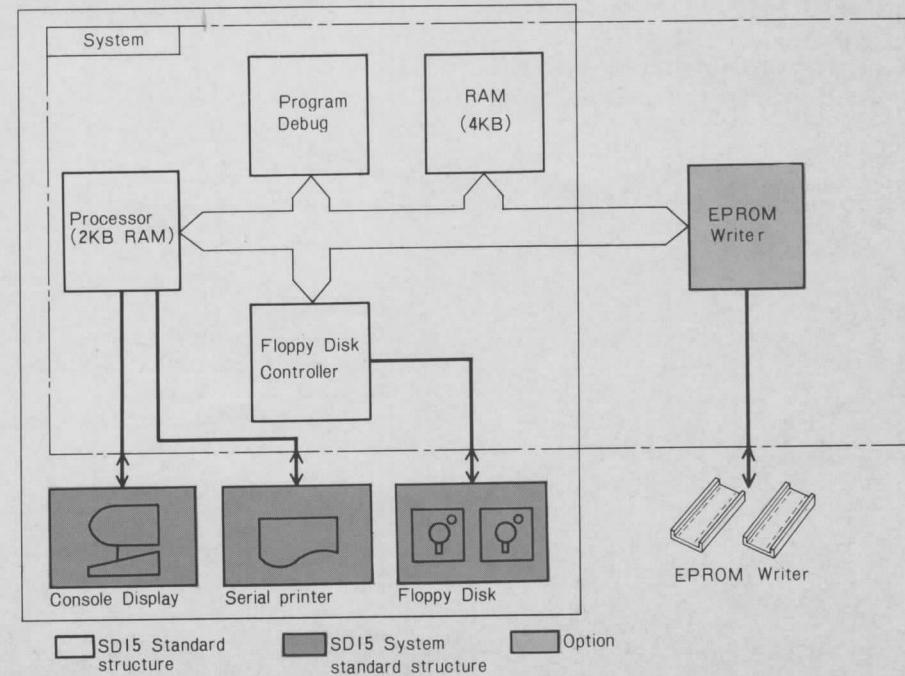
■ FEATURES

- ★ Program development in Compiler (PL/H) level can be performed and program generating time is therefore substantially reduced.
- ★ EMS (Executive Monitor System) is provided and conversational debug of user's system can be performed.
- ★ Floppy Disk can be used as the memory of large capacity. It affords rapid and easy operation.
- ★ Conversational development of user's program with CRT Display can be performed.

■ SOFTWARE STRUCTURE



■ HARDWARE STRUCTURE



Can be directly connected to actual equipment for Hardware and Software debugging.

H68SD20 (for HMCS6800)

H68SD20 is designed to perform easy program development at the Macro-assembler or at the Compiler (PL/H) level and easy debug of user's system based on FDOS (Floppy Disk Operating System).

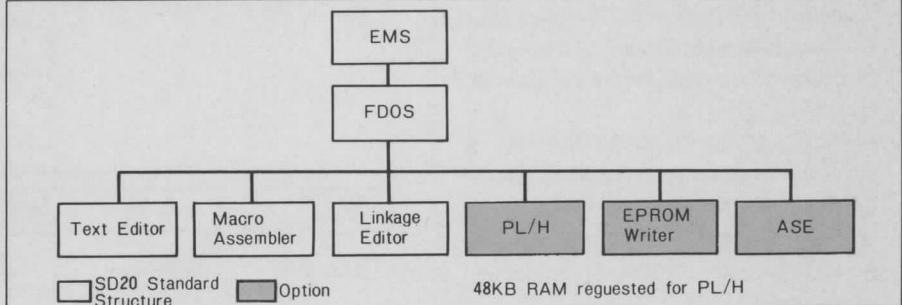
H68SD20 standard system is composed of the processor, Floppy Disk Drive, Console Display, Line Printer, EPROM Writer, Paper Tape Reader and prototype debugging equipment. Furthermore 52k-byte memory block are necessary for the Compiler (PL/H) Level program development.



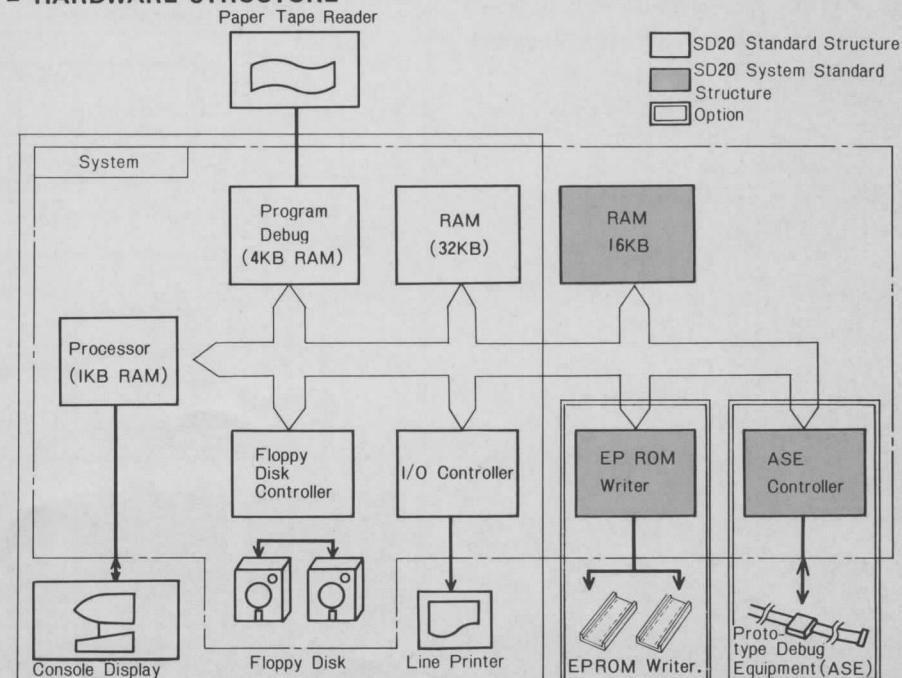
■ FEATURES

- ★ EMS is equipped and conversational debug of user's system can be performed.
- ★ Debug of the prototype can be performed when ASE (Adaptive System Evaluation) is equipped in the system as the expansion system.
- ★ Floppy Disk can be used as large-capacity memory and it affords rapid and easy operation.
- ★ Conversational development of user's program with CRT Display can be performed.
- ★ Program generating time is fairly reduced by using the Compilar (PL/H).

■ SOFTWARE STRUCTURE



■ HARDWARE STRUCTURE



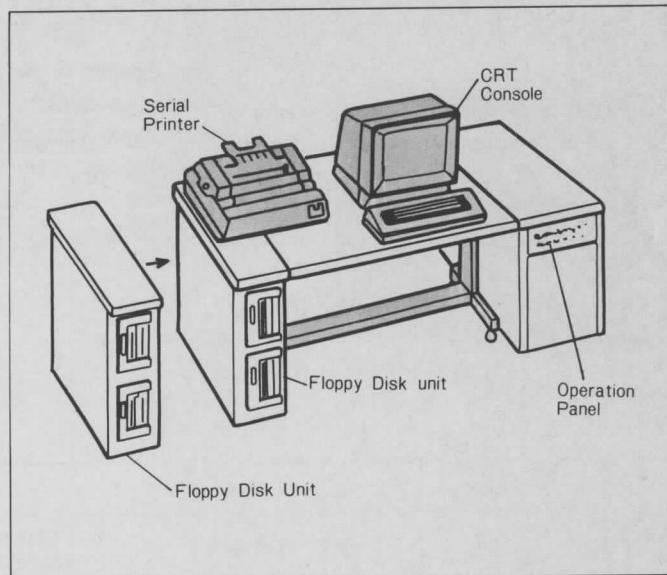
Useful for system development using a High-Level Language.

H680SD300 (for HMCS68000) Under Development

H680SD300 is an effective system developing equipment for a Microcomputer System composed of the most advanced 16 Bit Microcomputer HMCS68000 Series.

H680SD300 is designed for developing systems by employing the HD68000's Capability and Features in order to obtain optimum versatility and operability.

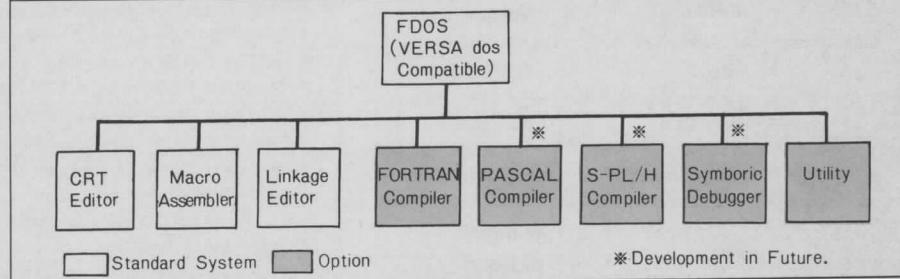
H680SD300 reduces the cost and the program generating time by utilizing High-Level Language (PASCAL, FORTRAN, S-PL/H). As the building Block structure, the ability of H680SD300 can be expanded from the Single-user system to the Multi-User System.



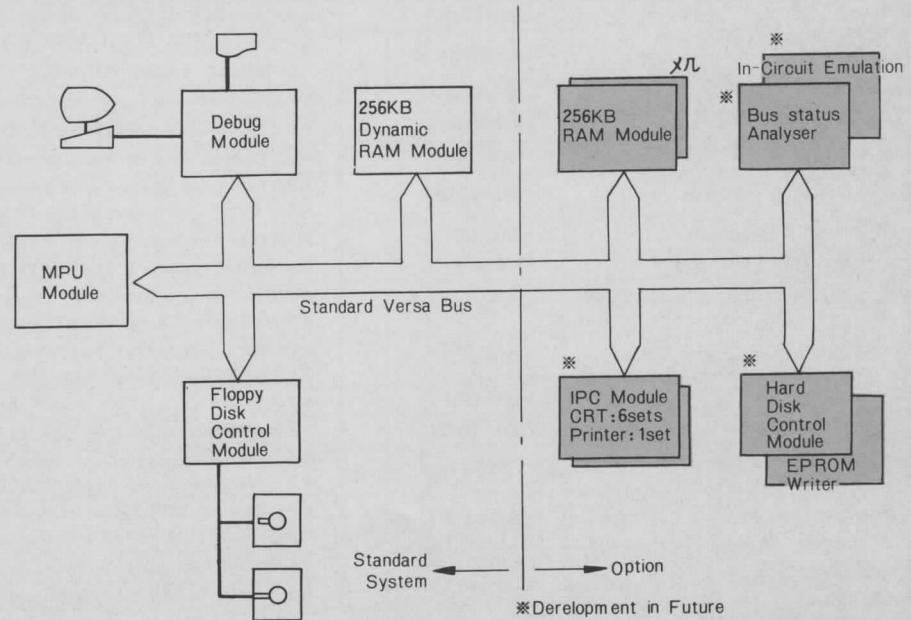
■ FEATURES

- ★ Complete Development System for HMCS68000 MCU.
- ★ Multi-Task Operating System
- ★ Resident FORTRAN High-Level Language.
- ★ Resident PASCAL High-Level Language.
- ★ Resident Super-PL/H High-Level Language.
- ★ Relocatable Macro Assembler.
- ★ Self-Testing Using Diagnostic Firmware
- ★ Intelligent Display Console with System Function Keys
- ★ 1 Mega Byte Dual Drive Floppy Disk
- ★ 180-CPS, 132 Column Line Printer
- ★ Optional In-Circuit-Emulation (future)
- ★ Front Panel Status/Error Indication
- ★ Multi Processor BUS Arbitration
- ★ Expansion to Multi-User Stations (future)
- ★ Hard Disk Expansion (future)

■ SOFTWARE STRUCTURE

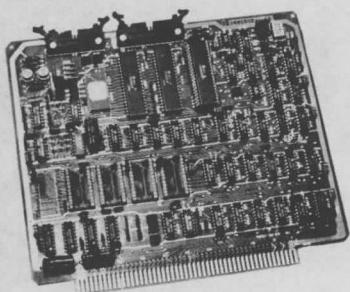


■ HARDWARE STRUCTURE



Facilitates microcomputer application.

SINGLE BOARD COMPUTER SBC SYSTEM



SBC System is the board family of the Microcomputer, developed as a built-in system for the equipment.

SBC System can be easily applied to the User's systems from software development and debugging by using various family boards and the Complete line-up of support software.

Function		Type No.	Features
CPU Board	H68SB02-1		<ul style="list-style-type: none"> • CPU HD46800 • 2 k Byte RAM • RMS Available • 32 Parallel I/O • Serial I/O Interface
	H68SB03-1		<ul style="list-style-type: none"> • CPU HD46800 • 4 k Byte EPROM (HN462716) • 1 k Byte RAM, RMS Available • 3PIA • 48 Parallel I/O
	H69SB01-1*		<ul style="list-style-type: none"> • CPU HD6809 • 4 k Byte EPROM or 8 k Byte EP ROM Available • 2 k Byte RAM • 32 Parallel I/O • 1 Serial I/O
DEBUG Board	H68DB03-1		<ul style="list-style-type: none"> • EMS (Executive Monitor System) by MASK ROM • 4 k Byte RAM • Debug for H68 Series, PTR Interface
	H69DB01-1*		<ul style="list-style-type: none"> • EMS by MASK ROM • 4 k Byte RAM • Debug for H69 Series • PTR Interface
Memory Board	Static Memory	H68SM16-1	<ul style="list-style-type: none"> • 16 k Byte Static Memory (HM472114P-4 x 32) • Ability to set up random address space by 4 k Byte/Unit
	Dynamic Memory	H68DM48-1	<ul style="list-style-type: none"> • 48 k Byte Dynamic Memory (HM4716A-4 x 24) • Parity check function
	CMOS Static Memory	H68CM08-1	<ul style="list-style-type: none"> • 8 k Byte CMOS Memory (HM4315P x 16) • Battery back up • Parity check function
	EPROM Board	H68PM32-1	<ul style="list-style-type: none"> • 32 k Byte EPROM Board • HN462716 x 16 Available (Socket)
	EPROM/RAM Board	H68XM68-1	<ul style="list-style-type: none"> • 8 k Byte Static RAM (HM472112P-4 x 16) • 16 k Byte EPROM (HN462716 x 8) Available (Socket)
EPROM WRITER Board	H68PW02-1		<ul style="list-style-type: none"> • READ/WRITE/COPY/VERIFY for HN462716 • 2 sockets for EPROM
	H68PW03-1*		<ul style="list-style-type: none"> • READ/WRITE/COPY/VERIFY/Blank check for HN462716/2732 HN2532/HN48016 • Erase HN48016 • 2 sockets for EPROM
Interface Board	Peripheral I/O Board	H68PR03-1	<ul style="list-style-type: none"> • Parallel I/O (16 Input, 16 Output 4 Control Line) • 2 Port Serial I/O
	Digital Input Board	H68DN01-1	<ul style="list-style-type: none"> • 32 Input Line • RC Filter in Receiver Circuit
	Digital Output Board	H68DT01-1	<ul style="list-style-type: none"> • 32 Output Line • Selectable Output Direct or Pulse
	Digital I/O Board	H68DX01-1	<ul style="list-style-type: none"> • 16 Input, 16 Output with 2 external Interrupt • RC Filter • Internal Interrupt by strobe signal
	Analog Input Board	H68AN01-1	<ul style="list-style-type: none"> • 32 channel Analog Input • 12 Bit A/D Converter resolution
	Analog Output Board	H68AT01-1	<ul style="list-style-type: none"> • 4 Analog output • 12 Bit D/A Converter resolution
I/O	Monitor TV Interface Board	H68MV01-1	<ul style="list-style-type: none"> • Cursor Blink function • Cursor control available • Scrolling function • 80 Characters x 20 Line
	Floppy Disk Control Board	H68FD03-1	<ul style="list-style-type: none"> • FDOS (Floppy Disk Operating System) Available • Controllable 4 sets Floppy Disk (FDD-101A or FDD 201A)
Accessories	Floppy Disk System	H68T402 H68T402D	<ul style="list-style-type: none"> • 2 x 256 k Byte Single Side Floppy Disk Drive • 2 x 512 k Byte Double Side Floppy Disk Drive
	Universal Board	H68WW02-1	<ul style="list-style-type: none"> • 57 x 61 through holes on board • 50 pin connector • 2 x 50 contact top edge connector
	Extender Board	H68EX02-1	<ul style="list-style-type: none"> • Facility for adjustment of board built-in system • Signal check terminal for all bus lines
		H68CC01-1	<ul style="list-style-type: none"> • 4 Boards Available
		H68CC02-1	<ul style="list-style-type: none"> • 4 Boards Available with Extendable Connector

* Under Development.

Note) H69SB01-1 can be connected to H68Series Boards.

Operating Condition: 0 ~ 50°C 30 ~ 85% RH

Board size = 230 x 200 mm²

Helps expand the range of microcomputer applications because it is small in size and low-priced.

SUPPORT SOFTWARE FOR SBC

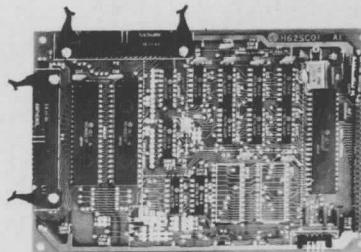
Function		Type No.	Media	Function		Type No.	Media
O.S.	MONITOR (EMS) MONITOR (RMS) FDOS-I FDOS-II	S68EMS1-R S68RMS2-R S68FDS1-F S68FDS2-F	MASK ROM MASK ROM Floppy Disk Floppy Disk	Language Processor	ASSEMBLER-II MACRO ASSEMBLER I MACRO ASSEMBLER II PL/H-II	S68ASS2-P S68MAS1-F S68MAS2-F S68PLH2-F	Paper Tape Floppy Disk Floppy Disk Floppy Disk
Utility	EPROM Writer EPROM Writer TEXT EDITOR-I TEXT EDITOR-I TEXT EDITOR-II LINKAGE EDITOR-I LINKAGE EDITOR-II	S68EPR2-P S68EPR3-F S68TED1-P S68TED1-F S68TED2-F S68LED1-F S68LED2-F	Paper Tape Floppy Disk Paper Tape Floppy Disk Floppy Disk Floppy Disk Floppy Disk	Combination	ASSEMBLER COMBINATION MACRO ASSEMBLER COMBINATION PL/H-II COMBINATION	S68MIX2-P S68MIX2-R S68SYS1-F S68SYS2-F S68SYS3-F	Paper Tape MASK ROM Floppy Disk Floppy Disk Floppy Disk

SINGLE CARD COMPUTER SC SERIES

The SC-Series is designed for low-cost and low-performance systems small size equipments in order to expand the applications of SBC.

■ FEATURES

- ★ Can be easily installed by binding screws
- ★ Unitized function
- ★ Semi-Custom Boards available
- ★ MPU: HD46802P, Timer: 16 x 1.024 msec standard
- Support Voltage: 5 V,
- Operating Condition: 0~55 °C, 30~85%RH
- Board Size: 175 ± 0.5mm x 115 ± 0.5 mm



Function Type Number	MPU HD46802P	IC Socket	Memory**						Timer	PIA		Remarks	
			Available Memory							PIA1	PIA2		
	HN462716	HN462716	HN462732	HN462732	HN462532	HN462532	HM6116	HM6116		HM6116	HM6116		
H62SC01	No	No	Yes	—	—	—	—	—	—	Yes	Yes	No	Standard
H62SC02	No	No	Yes	—	—	—	—	—	—	Yes	Yes	Yes	****
H62SC03	*Yes	Yes	Yes	—	—	—	—	—	—	Yes	Yes	Yes	
H62SC04	No	No	—	Yes	—	—	—	—	—	Yes	Yes	No	
H62SC05	No	No	—	Yes	—	—	—	—	—	Yes	Yes	Yes	
H62SC06	*Yes	Yes	—	Yes	—	—	—	—	—	Yes	Yes	Yes	
H62SC07	No	No	—	—	Yes	—	—	—	—	Yes	Yes	No	
H62SC08	No	No	—	—	Yes	—	—	—	—	Yes	Yes	Yes	
H62SC09	*Yes	Yes	—	—	Yes	—	—	—	—	Yes	Yes	Yes	
H62SC10	No	No	—	—	—	Yes	—	—	—	Yes	Yes	No	
H62SC11	No	No	—	—	—	Yes	—	—	—	Yes	Yes	Yes	
H62SC12	*Yes	Yes	—	—	—	Yes	—	—	—	Yes	Yes	Yes	
H62SC13	No	No	—	—	—	—	Yes	—	—	Yes	Yes	No	
H62SC14	No	No	—	—	—	—	Yes	—	—	Yes	Yes	Yes	
H62SC15	*Yes	Yes	—	—	—	—	Yes	—	—	Yes	Yes	Yes	
H62SC16	No	No	—	—	—	—	—	—	—	Yes	Yes	Yes	
H62SC17	No	No	—	—	—	—	—	—	—	Yes	Yes	Yes	
H62SC18	*Yes	Yes	—	—	—	—	—	—	—	Yes	Yes	Yes	

* : Available Prototype Hardware Debug.

** : Memory is not equipped.

*** : In case PIA2 is not equipped, I/O Interface connector is not equipped, either.

**** : H62SC02 ~ H62SC18, Please contact Hitachi Agents.

HMCS 68000 SBC System

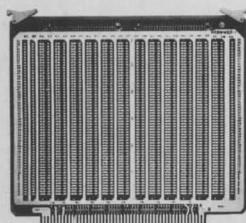
Function	Type Number	Features
CPU Board	H680SB01*	• CPU HD68000 • 16 k Byte ROM Area, • 4k Byte RAM • 16 Bit programmable I/O, • 16 parallel I/O
Monitor Board	H680MN01*	• 40k Byte ROM Area, 4k Byte RAM • Serial I/O, • 1 parallel I/O • Debugger (standard), • RMS available
MEMORY Board	H680DM12*	• 128 k Byte Dynamic Memory Board parity check, Auto Refresh Function

* Under Development.

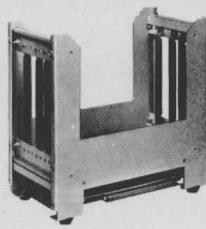
Note) Operating condition: 0 ~ 50°C, 30 ~ 85% RH.

Board size: 250 x 203 mm.

Accessories for SBC System



Universal Board
H68WW02-1

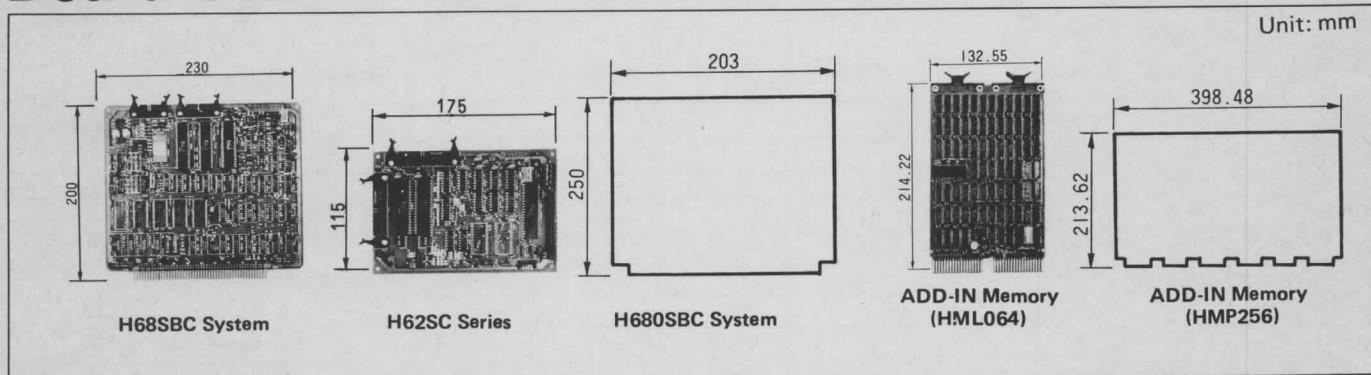


Card Gage
H68CC01-1
H68CC02-1



Floppy Disk System
H68T402
H68T402D

Board Size



Recommended for programming practice.

TRAINING MODULE H68/TR SERIES

H68TRA, H68TRB

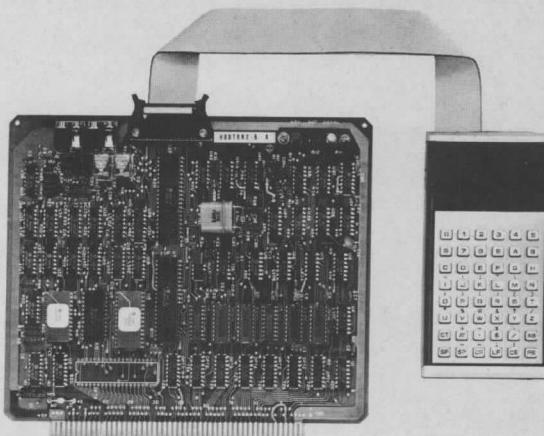
The H68TRA and H68TRB are main boards for the Hitachi Microcomputer Training Module Series.

■ FEATURES

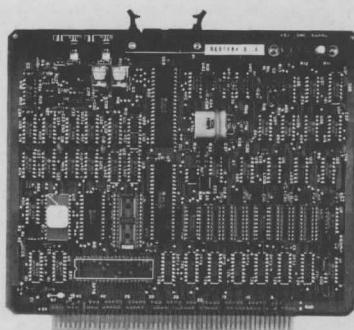
- ★ Both the H68TRA and H68TRB provide bus drivers and can be directly connected to extension boards such as Hitachi color display interface module H68CTV1.
- ★ A single-board computer with a console dedicated for H68/TR.
- ★ Standard-equipped 1-pass assembler.
- ★ Two audio cassette tape recorders can be directly connected.
- ★ Standard-equipped 1KB memory (RAM) (extra 2KB are optional)
- ★ Assembled and tested.
- ★ Single 5 volts supply operation.
- ★ The H68TRB is designed for application with the keyboard H68/KB. In the H68TRB the dedicated console H68PC01, which functionally overlaps the H68/KB, and the 4KB masked ROM, containing the dedicated monitor for H68PC01 are omitted from the H68TRA. As the dedicated keyboard (H68/KB) for the H68/TR, the H68KB01 with a masked ROM (x34) and the H68KB02 without a masked ROM are available.

■ SPECIFICATIONS

Item		Specifications	
Type		H68TRA	H68TRB
MPU		HD46800DP	
Memory	ROM	4 KB (monitor/assembler)	No (4 KB can be provided)
	RAM	128B system work area 1 KB (2 KB can be added)	
I/O Device	Basic input Output Device	Pocketable Console H68PC01 attached	No (For connection to the keyboard H68/KB)
	Bus	Bus drivers are provided (Extension board can be connected)	
	Parallel I/O	8 bit, 2 channel (option)	
	Serial I/O	Only for transferring data to and from an audio cassette tape recorder, standard-equipped, transfer speed: 300 bands	
Software	Monitor Debugger	Standard-equipped	No (can be provided, attached to x 34)
	Assembler	Standard-equipped	No (can be provided, attached to x 34)
	Text Editor	Available	
	Inverse Assembler	Available	
	BASIC-I	Combination with the TV interface module H68/TV	
	BASIC-II	Optional	
	BASIC-III	Optional	



H68TRA



H68TRB

H68/TR SERIES HARDWARE, SOFTWARE

The user can master every facet of the microcomputer while enjoying practicing with the Hitachi H68TR Series microcomputer training module. Many extension boards and Support software can meet the demand for system expansion step by step. Following hardware and software are provided in order to realize efficient system expansion.

■ HARDWARE

Function	Type Number	Features
Training Module	H68TRA H68TRB	• Adoption of real assembler Language for Microcomputer training.
TV Interface Module	H68TV01	• Standard-equipped Character and Graphic Mode. • Standard-equipped TV Monitor and Display Interface
CTV Interface Module	H68CTV1	• Standard-equipped 8 colors • Standard-equipped Character and Graphic Mode • Available 256 x 192 Dots resolution with B/W Display
STATIC MEMORY Board	H68TM04 H68TM16	• H68TM series is Static Memory Board for H68TRA/B exclusively • H68TM04 . . . 4 k Byte, H68TM16 . . . 16 k Byte
Peripheral Control Module	H68TPR1	• Standard-equipped dot Impact printer. Interface. • Standard-equipped digital cassette x 2 Interface. • Max. 8 k Byte EPROM can be mounted.
Mini Floppy Disk System	H68TF40	• Standard-equipped 2 mini Floppy Disk drivers (max. 80 k Byte x 2)
VHF Adapter	H68TVM1	• H68TVM1 converts color signals produced by the H68CTV1 into NTSC-composite video Signals

■ HARDWARE EQUIPMENT

Function	Type Number	Function	Type Number
1. KEY BOARD	H68KB01/02	7. CARD GAGE	H68CC01-1/02-1
2. POCKETABLE CONSOLE	H68PC01	8. CARD HOLDER	H68MH01
3. UNIVERSAL BOARD	H68WW02-1	9. PRINTER CABLE	H68TC01
4. EXTENDER MEMORY BOARD	H68EX02-1	10. VIDEO CABLE	H68VC01
5. MOTHER BOARD	H68MB01	11. 2.5φ PHONE CABLE	H68TC25
6. SYSTEM CASE	H68TSC1/2	12. 3.5φ PHONE CABLE	H68TC35

■ SOFTWARE

Function	Function
1. MONITOR	8. TEXT EDITOR
2. TV MONITOR	9. INVERSE ASSEMBLER
3. Color TV MONITOR	10. MONITOR SUB-ROUTINES
4. ASSEMBLER/TEXT EDITOR	11. TV SUB-ROUTINES
5. BASIC-I	12. EXTENSION I/O SUB-ROUTINES
6. BASIC-II	13. PATTERN GENERATOR
7. BASIC-III	

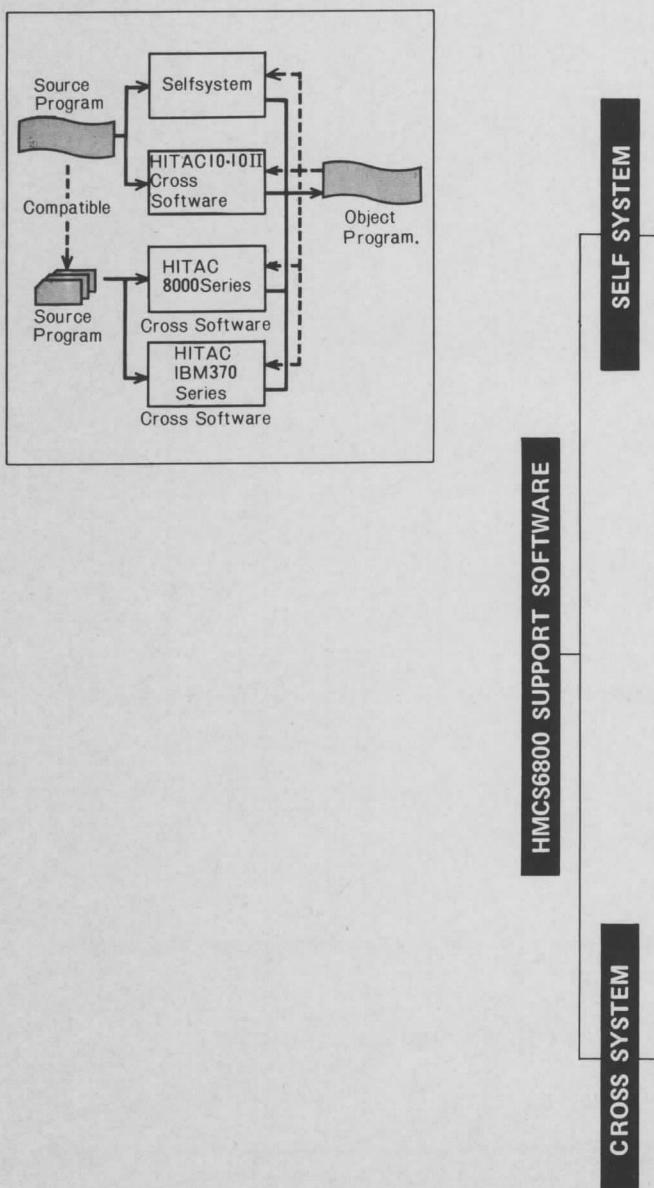
HITACHI SUPPORT SOFTWARE CONFIGURATION

Self System and Cross System are provided as Support Software for application program development.

These full Support Software facilitate the development of the application program for microcomputer system.

■ COMPATIBLE OF PROGRAMS

Self-System and Cross System are compatible through both Source program and Object program as follows.



- SBC Series SOFTWARE**
 - EMS (S68EMS1-R)
 - RMS (S68RMS2-R)
 - EPROM Writer, Paper Tape (S68EPR2-P)
 - EPROM Writer, Floppy Disk Sheet (S68EPR3-F)
 - ASSEMBLER-I, TEXT EDITOR-I, MASK ROM (S68MIX2-R)
 - FDOS-1 (S68FDS1-F)
 - MACRO ASSEMBLER-I (S68MAS1-F)
 - LINKAGE EDITOR-I (S68LED1-F) (S68SYS1-F)
 - TEXT EDITOR-I (S68TED1-F)
 - FDOS-II (S68FDS2-F)
 - MACRO ASSEMBLER-II (S68MAS2-F)
 - LINKAGE EDITOR-II (S68LED2-F) (S68SYS2-F)
 - TEXT EDITOR-II (S68TED2-F)
 - PL/H (S68PLH2-F) (S68SYS3-F)
 - CROSS MACRO ASSEMBLER for HD6801 (S61XAS1-F)
 - CROSS MACRO ASSEMBLER for HD6809 (S69XAS2-F)
 - CROSS ASSEMBLER for HD6805 (S65XAS1-F)
- H68SD10 SOFTWARE**
 - STANDARD : EMS, ASSEMBLER-II, TEXT EDITOR-I
 - OPTION : EPROM WRITER, FDOS-I/II, TEXT EDITOR-I/II, MACRO ASSEMBLER-I/II, LINKAGE EDITOR-I/II, CROSS MACRO ASSEMBLER for HD6801, HD6809 CROSS ASSEMBLER for HD6805
- H68SD15 SOFTWARE**
 - STANDARD : EMS, FDOS-II, TEXT EDITOR-II, MACRO ASSEMBLER-II, LINKAGE EDITOR-II
 - OPTION : EPROM WRITER, PL/H, CROSS MACRO ASSEMBLER for HD6801, HD6809 CROSS ASSEMBLER for HD6805
- H68SD20 SOFTWARE**
 - STANDARD : EMS, FDOS-II, TEXT EDITOR-II, LINKAGE EDITOR-II, MACRO ASSEMBLER-II
 - OPTION : PL/H, EPROM Writer, ASE (S68ASE 1-F), CROSS MACRO ASSEMBLER for HD6801, HD6809 CROSS ASSEMBLER for HD6805
- H68SD5 SOFTWARE**
 - STANDARD : FDOS-II, TEXT EDITOR, EPROM Writer
 - OPTION : ASSEMBLER for HD6801, HD6805, HMCS40 Series Emulator for HD6801, HD6805, HMCS40 Series
- H68/TR SOFTWARE**
 - STANDARD : MONITOR, ASSEMBLER, TEXT EDITOR REVERSE ASSEMBLER APPLICATION
- H68TV01 SOFTWARE**
 - STANDARD : TV-MONITOR, BASIC-I, TV SUB-ROUTINE
 - OPTION : BASIC-II (S68BSC2-R), PATTERN GENERATOR (S68PTG1-R)
- H68CTV1 SOFTWARE**
 - STANDARD : MONITOR, ASSEMBLER EDITOR
 - OPTION : BASIC-III (S68BSC3-C, S68BSC3-R) APPLICATION
- H68TPR1 SOFTWARE**
 - STANDARD : I/O CONTROL SUB-ROUTINE
- HITAC10/10 II 16 kW CROSS SOFTWARE**
 - HITAC10/10II 8 kW CROSS SOFTWARE**
 - MONITOR, ASSEMBLER, SIMULATOR, TEXT EDITOR (S68CR11-P)
 - S68CR11-P + PROGRAM for CARD READER (S6812-P)
 - HITAC10/10II 16 kW CROSS SOFTWARE**
 - MONITOR, ASSEMBLER, SIMULATOR, TEXT EDITOR (S68CR21-P)
- HITAC M-SERIES/IBM370 CROSS SOFTWARE**
 - ASSEMBLER, SIMULATOR, PAPER TAPE OUTPUT PROGRAM (S68CRM1-T)
 - ASSEMBLER for HD6809, SIMULATOR, PAPER TAPE OUTPUT PROGRAM (S69XSY1-T)

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